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RIGID-BODY SIMULATION OF A FRICTION-LOCKED CHAIN DRIVE MECHANISM

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Conveyance in the industrial sector is commonly carried out by chain-sprocket systems that transmit power by form-closure. For harsh environments, however, sprocket-driven systems are less suitable due to their liability to wear, which motivates the deployment of friction-driven chain mechanisms. But either way, sprocket-driven or friction-driven, chain drives experience periodic fluctuation of velocities due to the discrete structure of the chains forming polygons around wheels instead of circles. A planar model of a friction-driven chain mechanism based on point-coordinates is presented for analyzing the dynamic response resulting from the polygon effect and from impacts that occur when chain links enter and run off the driving and driven wheel, respectively. Numerical issues associated with the detection of impacts, the stiffness of the system, and the error accumulation in the constraint equations are addressed. As an example of application, the model of a bucket elevator as utilized in the cement industry to convey bulk materials vertically is referred to.

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